Protective Claims:

1.   Method for measuring an electrical voltage, wherein the electrical voltage is an alternating quantity, making use of at least one sensor element (20) and evaluating means (30) by utilizing the Pockels effect and using at least one light source (31) and at least one optical transmission path (OS), wherein a measurement light generated by the light source (31) penetrates an active sensor part (21) comprising at least two sensor crystals at which an electrical voltage drops, and, after the measurement light has traversed the sensor crystals, the polarization state of the measurement light is further used for processing information which, after suitable evaluation, represents a measurement for the electrical voltage dropping over the sensor crystals, wherein the selected quantity of sensor crystals on the measurement path is sufficiently large with respect to the inhomogeneity of the electrical field distribution, and the length of the measurement path is in the same order of magnitude as the length of the path along which the voltage to be measured drops.

2.   Method according to claim 1, wherein an active sensor part (21) is used which contains a temperature-dependent material having a temperature dependency of the optically activity, wherein the optical activity provides a measurement for the temperature prevailing at the temperature-dependent optical element (16) to assess the measurement values.

3.   Method according to ~~one of claims 1 or~~ 2 claim 1, wherein the sensor crystals contained in the active sensor part (21) are penetrated by an individual light beam one after the other in the same crystallographic orientation, and the results of the electro-optical effects on the light beam in the individual crystals are summed, and the sum of the effects of the electro-optical effects in the sensor crystals is available as a basis for determining the present voltage and is applied for this purpose.

4.   Method according to ~~one of claims 1 to 3~~ claim 1, wherein the partial voltage (U_1) dropping over a sensor element (20) is measured and the partial voltage (U_2)

dropping over at least one further sensor element (20) is measured and the sum of the measured partial voltages is available for determining the total voltage present at the sensor elements and is used for this purpose.

5.   Method according to ~~one of claims 1 to 3~~, *Claim 1* wherein the partial voltages U_1 to U_{NSE} dropping over a plurality N of sensor elements (20-1,..,20-N) and the sum of the partial voltages from U_1 and U_N are available for determining the total voltage U to be measured and are used for this purpose.

6.   Method according to ~~one of claims 1 to 5~~, *Claim 1* wherein the voltages $U_{SA,1}$ .. $U_{SA,NSA}$ present at a quantity N_{SA} (N_{SA} is greater than or equal to 1) of active sensor parts (21) are measured, and the sum of the voltages from $U_{SA,1}$. .$U_{SA,NSA}$ is available for determining the voltage U present at the sensor element (20) and used for this purpose.

7.   Method according to ~~one of claims 1 to 6~~, *Claim 1* wherein the optical waves transmitted by the sensor element(s) (20) are detected and, as signal I, are each converted to a signal I_N via a component assembly (40) contained in evaluating means (30) in that this signal I comprises an AC component I_{AC} as characteristic quantity which changes over time with the frequency of the voltage to be measured, whose time constant is designated by T_{AC}, and the change in the DC component I_{DC} is described as another characteristic quantity of signal I with time constant T_{DC}, wherein time constant T_{DC} is appreciably greater than T_{AC} and the scaling is effected by multiplying signal I by a factor K in such a way that the DC component of I_N takes on the predetermined value of a reference signal V_{ref}, and factor K which is used in preparation is determined in a closed control loop.

8.   Method according to ~~one of claims 1 to 6~~, *Claim 1* wherein the optical waves transmitted by the sensor element(s) (20) are detected and, as signal I, are each converted to a signal I_N via a component assembly (40) contained in the evaluating means (30) in that this signal I comprises an AC component I_{AC} as characteristic quantity which changes over time with the frequency of the voltage to be measured,

whose time constant is designated by T_{AC}, and the change in the peak value of the signal I_S is described as another characteristic quantity of signal I with time constant T_S, wherein time constant T_S is appreciably greater than T_{AC} and the scaling is effected by multiplying signal I by a factor K in such a way that the peak value of I_N takes on the predetermined value of a reference signal V_{ref}, and factor K which is used in preparation is determined in a closed control loop.

9.   Device for measuring the electrical voltage, wherein the electrical voltage is an alternating quantity, and with at least one light source (31) and at least one optical transmission path (OS), at least one sensor element (20) and evaluating means (30) accompanied by the use of the Pockels effect, wherein the sensor element(s) (20) contain(s) at least one active sensor part (21) comprising at least N_{SK} (N_{SK} is greater than or equal to zero) electro-optical sensor crystals ($SK_1...SK_N$) which are penetrated by a polarized measurement light.

10.   Device according to claim 9, wherein the an additional optical element (16) follows the electro-optical sensor crystals ($SK_1...SK_N$) which are penetrated by a polarized measurement light.

11.   Device according to claim 10, wherein the electro-optical sensor crystals ($SK_1...SK_N$) which are penetrated by a polarized measurement light are made of $Bi_4Ge_3O_{12}$.

12.   Device according to claim 10, wherein the electro-optical sensor crystals ($SK_1...SK_N$) which are penetrated by a polarized measurement light are made of $Bi_4Si_3O_{12}$.

13.   Device according to claim 10, wherein the electro-optical sensor crystals ($SK_1...SK_N$) which are penetrated by a polarized measurement light comprise a compound of crystal group $\overline{4}3m$.

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14. Device according to ~~one of claims 10 to 13~~, *claim 10* wherein the optical element (16) is made of $Bi_{12}GeO_{20}$.

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15. Device according to ~~one of claims 10 to 13~~, *claim 10* wherein the optical element (16) is made of $Bi_{12}SiO_{20}$.

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16. Device according to ~~one of claims 10 to 13~~, *claim 10* wherein the optical element (16) comprises a compound of crystal group 23.

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17. Device according to ~~one of claims 9 to 16~~, *claim 9* wherein the active sensor part (21) comprises a plurality of sensor crystals which are directed successively, can be penetrated by an individual light beam and have the same crystallographic orientation.

18. Device according to claim 17, wherein the sensor crystals are enclosed by a spatial structure which is constructed so as to enable the orientation of a plurality of sensor crystals in the direction of transillumination.

19. Device according to claim 18, wherein the spatial structure is constructed so as to carry the sensor crystals externally and the sensor crystals are oriented in the direction of transillumination.

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20. Device according to ~~one of claims 9 to 19~~, *claim 9* wherein, when N_{SE} sensor elements (20) are used (N_{SE} is greater than or equal to one), these sensor elements (20) are arranged in such a way that the partial voltages $U_{SE,1}$ to $U_{SE,NSE}$ drop at these sensor elements (20) and the sum of the partial voltages gives the total voltage U to be measured.

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21. Device according to ~~one of claims 9 to 19~~, *claim 9* wherein the evaluating means (30) contain at least one component assembly (40) by means of which the scaling is carried out by multiplying the input signal by a factor which is generated by

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a function unit, its input quantity representing the difference between a reference signal and the factored input signal.

22. Device according to claim 20, wherein the function unit is an integrator.

23. Device according to claim 20, wherein the function unit is a low-pass.

24. Device according to claim 20, wherein the function unit is a peak value rectifier.

25. Device according to claim 9, wherein more than two active sensor parts (21) are used and the quantity of sensor crystals N_{SK} in the active sensor parts may vary.